Center for Operational Oceanographic Products and Services
Information Systems Division

Year 2000 Compliancy

Critical System Test Plans: PORTS ™

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1.1 Physical Oceanographic Real Time System (PORTS)

Summary:

C   In their presently used form, none of the software had problems handling or manipulating dates and time. All software is deemed compliant with Y2K requirements.

C   All PORTS data acquisition system (DAS) computers use NTP (Network Time Protocol) to set the real-time clock twice a day. Unix does not use the PC BIOS. All PORTS hardware and software is compliant.

1.1.1 Software and Firmware Compliancy

1.1.1.1 Commercial Off the Shelf (COTS) Application Software

The PORTS DAS uses the Unix version of Kermit 6.0.192. This version is compliant according to the Year 2K notice provided users through the Kermit FAQ at Columbia University web site.

1.1.1.2 Operating Systems and BIOS

The underlying SCO UNIX operating system has no problem with Y2K. However, the 'date' program had a bug that does not allow it to set the year properly on December 31, 1999. The problem was eliminated by installing (1) SCO Unix patch SLS U0D426 for use with the SCO Unix System V/386 Release 3.2 Operating System and Development System Version 2.0, 4.0, 4.1 and 4.2. or (2) SCO Unix patch SLSUOD426 with SCO Open Server Release 3.0 Network.

1.1.1.3 In-House Written Software

C   **General**

All programs that manipulate dates recognize that the year 2000 is a leap year. Some programs that are expected to run only in real-time applications treat all century years as leap years (this makes them good until 2100). If they use a two digit year, the assumption is that any year greater than 90 is 19xx and years less than 90 are 20xx. All programs that use Julian dates use exactly the same source code for subroutines across all platforms (PC DOS, Unix, Windows).
The files used to build the DAS screen and the voice data response system (VDRS) screen use two digit years. The screen programs compensate by adding 1900 if the year is greater than 50, or adding 2000 if the year is less than 50. Since this a real-time system, this imposes no limitations. Internally, all programs use

Julian dates (the number of days since 4753 B.C.). Julian dates have no limitations as to the year used. This involves mainly a software management problem of making sure that all updated programs are put on a particular PORTS site at the same time.

C   **Ports Data Processing** (Instrumentation)

The RDI Narrowband acoustic doppler current profiler (ADCP) has no year field in the data from the instrument. Since the instruments clock has no year, it also does not recognize leap years with 29 days in February. The DAS processing software adds a year field in two un-used bytes of the ADCP data and re-computes the checksum before storing the data. If necessary, an option in the processing program can be used to completely ignore the ADCP's date, and replace it with the DAS's.

The RDI Broadband ADCP's have a year field, but it is only the last two digits of the year. The DAS adds 2000 to any year less than 91, and adds 1900 to any year greater than 90. It does not change the raw data in any way. Again, since this a real-time system, this imposes no limitations.

The Sontek ADP's use a full 4 digit year. The Sutron water level gages use a full 4 digit year.

C   **Date and time subroutines**

All the date manipulation routines use a true Julian date internally. Dates are converted to Julian, manipulated and then converted back to Gregorian as necessary. A four digit year is used during all these manipulations. The system time interface routines retrieve and set a four digit year. The central routines used by all the others are j2date and date2j. These are the only routines to actually convert between Julian and Gregorian dates and are the only ones that need to be shown to be explicitly compliant.

C   **Testing the in-house written date manipulation routines**

The following time manipulation routines have been examined and tested to be Y2K compliant:

Module NTADJ.F
         ntadj, jntadj, timadj, dattim, jdattim, lcltim, jlcltim, s2local, datetz, makdat, jmakdat, makdats, jmakdats, nowgmt, jnowgmt, nowlcl, jnowlcl

Module JULIAN.F
         j2date, date2j, dayowkg, jx2date, date2jx, date2s, s2date, s2jdate, jdate2s, date2jd, jd2date, j2datejd

The test started with date 12/01/1999. It was then converted to julian date. A 1 was added to the julian date, converted to gregorian and then printed. This test was performed 120 times. The output was examined and determined that each date was computed correctly. The test program will print out the dates from 12/1/1999 through 3/29/2000.

Program listing to test julian conversion routines:

```
        integer iyear,imonth,iday,ihour,iminute,isecond
        double precision xjulian
*       set starting gregorian date of 11/31/1999 00:00
        iyear = 1999
        imonth = 11
        iday = 31
        ihour = 0
        iminute = 0
        isecond = 0
*       Do the next 120 days
        do i=1,120
*         convert date from gregorian to julian
          call date2j (iyear,imonth,iday,ihour,iminute,isecond,xjulian)
*         add 1 day to the julian date
          xjulian = xjulian + 1.0d0
*         convert the julian date back to gregorian
          call j2date (xjulian,iyear,imonth,iday,ihour,iminute,isecond)
*         print the date
          print 100, imonth,iday,iyear,ihour,iminute,isecond
100       format (2(i2.2,'/'),i4,2x,2(i2.2,':'),i2.2)
        end do
        end
```

C   **Testing End to End Processing and Dissemination**

All testing was done on the PORTS development laptop, using exactly the same UNIX operating system and software as is installed on an operational PORTS DAS.

The following processes were used to show Y2K compliance. During the actual test, the following dates were used:January 1, 2000
February 28, 2000
February 29, 2000
March 1, 2000

Process data with a date of January 1, 2000 GMT
A single file, containing water level data for St. Petersburg, Florida was captured.
The date was modified to indicate January 1, 2000 1200 hours

Sample water level data after time stamp modification:

```
Link state is: DISCONNECTEDcmd:cmd:*** CONNECTED to STPETEp
  Password:
NOS NGWLMS 87265201 01/01/2000 12:00:00
  1.118, 0.006,  0, 20.2, 19.8
  1.860, 0.003,  2, 20.5, 12.6
   0.8,  97,  1.9
999999
999999
999999
999999
999999
999999
999999
999999
999999
999999
999999
999999
999999
0  1.000   0.000   0.000   5.627  1.118   64 114 58405
DATA COMPLETE

Login user:
30 Nov 1998 06:45:31
cmd:cmd:*** DISCONNECTED
```

The UNIX system clock was changed to January 1, 2000 0703 EST. There is a 5 hour
difference between the water level time (Greenwich Mean Time) and the system clock,
which runs Local Time.
The data was then processed with the 'tl' program with no problems.

The 'tl' program creates a file that is used for the screen and voice dissemination systems.
This file uses a 2 digit year field. However, this causes no problem, because any year
less than 90 is assumed to have a century field of 2000. As PORTS is a real-time
system, there is no necessity to handle any dates earlier than this year.

Sample screen/voice data file:

```
000101120000
St. Petersburg
  360
    2     4         97
   .5
  .00
   0.
 -999
 -999
 -999     0
    0     0
    0     0
999.9     0
999.9     0
999.9     0
  0.0          0
```

The above file is then used to build the text and voice dissemination screens. A complete set of the screen/voice data files for Tampa Bay PORTS was moved to the laptop. A special program was used to modify all the time stamps to the same date (January 1, 2000 1200 GMT for this example). The screen generation program was then run to generate the below product.

Sample Text Screen:

```
              Tampa Bay PORTS (Physical Oceanographic Real-Time System)
                    at  7:00 am EST  January  1, 2000
                  National Oceanic and Atmospheric Administration
                            National Ocean Service
...........................................................................
              TIDES                 :              CURRENTS
Port of Tampa       2.1 feet,Rising : Sunshine Skyway      1.3 kts.(F), 043ET
Port Manatee        1.9 feet,Rising : Port Manatee         1.1 kts.(F), 050ET
St. Petersburg      1.8 feet,Rising : Old Port Tampa       0.1 kts.(S), 355ET
Old Port Tampa      1.9 feet,Rising : (F)lood, (S)lack, (E)bb, towards ETrue
..........................................:................................
              METEOROLOGICAL                    :   BOTTOM WATER TEMP
Sunshine Skyway    15 knots from NW , gusts to  17   :   Sunshine Skyway
                     Air temp.  59EF                 :   64EF
                     Pressure 1022 mb.               :   Port Manatee
Port of Tampa       9 knots from WSW, gusts to  14   :   64EF
Port Manatee        3 knots from WNW, gusts to  10   :   Old Port Tampa
St. Petersburg      8 knots from NW , gusts to  12   :   62EF
Old Port Tampa     17 knots from NW , gusts to  19   :
...........................................................:.................
.
**** - Data not displayed as a result of quality control monitoring. For more
information, go to http://www.opsd.nos.noaa.gov/corms_status.html
```

The voice dissemination system provides similar information in a different format designed to be read by the Voice Dissemination Response System (VDRS). The VDRS does not use any date information, just the local time. Below is a sample of the VDRS data:

Sample VDRS data screen:

```
OK
07:00
1.3 flood                    1.1 flood                    0.1 slack
64                           64                           62
                                                                 OK
 15 NW   17      9 WSW  14      3 WNW  10      8 NW   12     17 NW   19
      OK             OK             OK             OK             OK
         2.1+           1.9+           1.8+           1.9+
              OK             OK             OK             OK
 59 1022
         0.0  0.0      0.0  0.0      0.0  0.0      0.0  0.0


Sunshine Skywa Port of Tampa  Port Manatee   St. Petersburg Old Port Tampa
```

These tests demonstrated that data would be properly processed with dates in the year 2000, including both before and after the February 29 leap day.

1.1.2 Hardware Compliancy

All PORTS DAS components used to acquire, process and subsequently disseminate data use using Personal Computing platforms. See "Year 2000 Compliancy: Critical System Test Plans: Personal Computers" for a description of PC compliancy issues.